User Manual

LONWORKS® Interface Card OPC-G11S-LON

for

GE-FUJI Frenic5000 G11s/P11s and

GE-FUJI AF-300 G11/P11

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Introduction

The GE FUJI LONWORKS® Interface Card OPC-G11S-LON enables system integrators to access data on a variable speed drive (VSD) over a LON. It complements the regular features on the VSD that an operator can access from the keypad on the drive.

Section 1, *Installation*, shows how the put the card into the VSD and get it wired to begin configuration.

Section 2, *Configuration*, explains how to set up the card to communicate with the VSD.

Physical Description

The Interface Card is a printed circuit assembly inside a plastic housing that mounts between the VSD body and keypad. It connects to the drive through a multi-pin connector and has a removable screw-terminal receptacle that is used to connect to the LON cable.

Electrical Description

The Interface Card contains its own microprocessor and memory. It communicates with the VSD through a serial communications channel on the regulator board connector. Power to the Card is provided by the VSD through the multi-pin connector and is isolated by a power converter.

Installation

This chapter covers the installation of the LONWORKS Interface Card into the AF-300 G11 or P11 variable speed drive (VSD) and the physical connection to the LON.

The Interface Card is shipped enclosed in a plastic housing that you have to install into the drive. The assembly is designed to integrate seamlessly within the VSD under the keypad so that the NEMA rating of the drive is maintained. Figure 1 shows the Card assembly.

Follow the procedure to install the assembly in the VSD.

To remove the keypad:

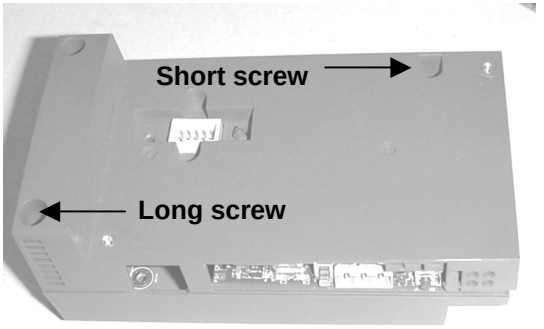
1. Power down the drive.
2. Remove the two keypad mounting screws, shown in Figure 1, and take the keypad out.

Figure 1 Keypad mounting screws

To mount the assembly:

1. Put the assembly onto the drive body and push gently until the back of the assembly is resting on the drive body.
2. Put the long and short screws through the mounting holes as shown below and secure the assembly to the drive body.

Figure 2 Interface Card Assembly

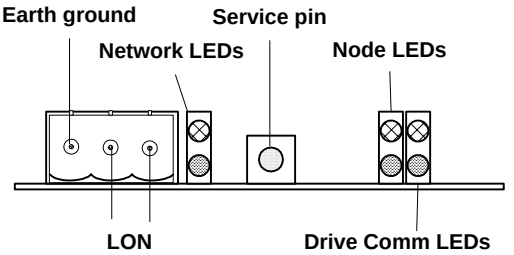


3. Put the keypad onto the assembly and push gently until the back of the keypad is resting on the assembly.
4. Install the keypad screws into the threaded holes in the assembly.

Connecting the Wiring

Figure 3 shows the network plug receptacle.

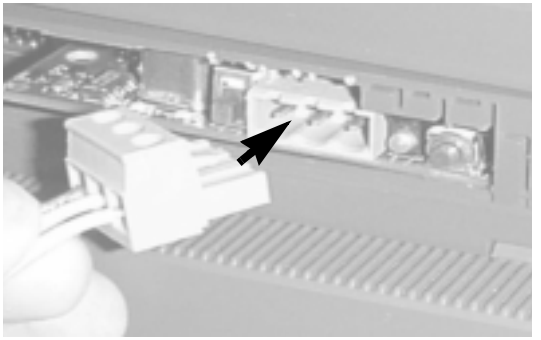
Figure 3 Network plug receptacle



Note: Connect the earth ground terminal to a nearby earth ground.

- Plug the terminal block into the LonWorks interface card as shown in Figure 4.

Figure 4 Attaching the LON plug



You can power up the drive and then go to Section 2, *Configuration*, for information about configuring the VSD with the software interface.

All configuration data is stored in a master file in the VSD. This is so that, whether you configure the VSD through the keypad or the Interface Card, you will be looking at the same configuration settings.

Bringing the VSD onto the Network

To add the VSD node to the building network:

- Using your network tool (for example, LonMaker, Circon System Integrator, etc.) add the VSD to your network.

The first time you try to bring the VSD onto the network an *Er4 type* error may occur on the VSD. If this happens, press the Reset button on the VSD keypad; when the reset is complete the drive will be ready to configure.

Starting the VSD

The network variable *nvidrvSpeedSetpt* sets the speed of the drive. (See Tables 1-3 for network variable descriptions.)

VSD Network Interface

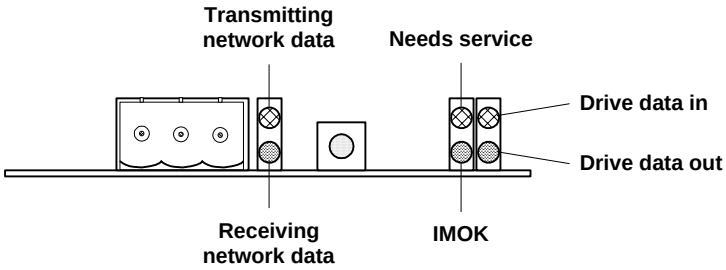
After the VSD is online you can monitor the it and set the configuration variables that represent the most common functions used in HVAC applications of VSDs.

To get the current configuration parameters from the VSD to Node Editor you have to upload them after the VSD is online.

Status LEDs

The LONWORKS interface card has six LEDs that show the communication status of the VSD. Figure 5 shows the LED functions.

Figure 5 LED functions



Network Variables

There are four types of network variables that enable the VSD to communicate with your PC through the Interface Card:

- Configuration variables
- Output variables
- Input variables
- Special purpose variables

Configuration Variables

Table 1 shows the configuration network variables that you can set through your network tool or through the VSD keypad. The function codes shown in the table are from the VSD and are mapped to the variable in the same row of the table.

Table 1 Configuration variables

Configuration properties	Function code	Description
UCPT_BaseFreq	F04	Set to the frequency that matches the rated output voltage on the motor nameplate. Default setting is 60 Hz.
SCPTdefScale	n/a	Used as the default value for **nviDrvSpeedScale**. Set this at 100% (for 60 Hz). The valid range is -163.840% to 163.830% and can be changed in 0.005% increments.
UCPT_JogFreq	C20	Default setting is 5 Hz. The valid range is 0 to 120 Hz and can be changed in 0.01 Hz increments.
UCPT_JumpFreq	C01 C02 C03 C04	Sets the VSD to avoid frequencies that cause mechanical noise and vibration. The valid range is from 25 to 120 Hz and can be changed in 1 Hz increments.
UCPT_LinkFunc	H30	Enables the Interface Card to transfer data over the network. Set to 3 for Interface Card operation. Default setting is 0.
SCPTmaxSetpoint	F15	Represents the maximum motor rated rpm (**nciNmlSpeed**) as percent. Default value is 70%.
SCPTminSetpoint	F16	Sets the minimum speed of the motor as percent of motor nameplate rated rpm (**nciNmlSpeed**). Default value is 0 and is typical set between 0 and 40%.
SCPTminSendTime		Writing a value to **nciMinOutTm** greater than a small minimal value causes all updates to output variables listed in Table 2 to cease. The range is from 0.01 to 6553.4 seconds and can be changed in 0.1 second increments. The **nciSndHrtBt** timer must be set for this variable to work.
UCPT_multStepFreq	C05	Please refer to pages 5-18 and 5-28 in the *AF-300 P11 Instruction Manual* for details.
SCPTnomRPM		Nameplate rated rpm of the motor.

Table 1 Configuration variables (Continued)

Configuration properties	Function code	Description
SCPTnomFreq		Nameplate rated frequency of the motor.
UCPT_PIDsettings	H22 to H25	This group of functions collects information from sensors, compares it with the setpoint values, then makes adjustments to VSD operations to correct deviations from setpoint values. Please refer to pages 5-39 to 5-41 in the *AF-300 P11 Instruction Manual* for more details.
SCPTrampUpTm	F07	The time in seconds allowed for the motor to reach maximum operating frequency after a run command is received. Default value is 6 seconds for 30 hp VSDs and 20 seconds for 40 hp VSDs. The range is from 0.01 to 3600 seconds and can be changed in 0.01 second increments.
SCPTrampDownTm	F08	The time in seconds allowed for the motor to decelerate from maximum operating frequency to zero hertz after a stop command is received. Default value is 6 seconds for 30 hp VSDs and 20 seconds for 40 hp VSDs. The range is from 0.01 to 3600 seconds and can be changed in 0.01 second increments.
SCPTrampUpTm2	E10	An alternate time for the motor to reach maximum operating frequency after a run command is received. Default value is 6 seconds for 30 hp VSDs and 20 seconds for 40 hp VSDs. The range is from 0.01 to 3600 seconds and can be changed in 0.01 second increments.
SCPTrampDownTm2	E11	An alternate time for the motor to decelerate from maximum operating frequency to zero hertz after a stop command is received. Default value is 6 seconds for 30 hp VSDs and 20 seconds for 40 hp VSDs. The range is from 0.01 to 3600 seconds and can be changed in 0.01 second increments.
SCPTmaxRcvTime		Turns on a timer that overwrites the **`nviDrvSpeedSetpt`** and **`nviDrvSpeedScale`** variables with their defaults when it expires. Writing to these two variables resets the timer. The range is from 0.1 to 6553.4 seconds and can be changed in 0.1 second increments. A value of zero disables the timer.
SCPTmaxSendTime		Starts a timer that updates output variables listed in Table 2 at the desired rate. The range is from 0.1 to 6553.4 seconds and can be changed in 0.1 second increments. Must also have **`nciMinOutTm`** active.

Table 1 Configuration variables (Continued)

Configuration properties	Function code	Description
UCPT_StrtStpFreq	F23 & F25	Start frequency (F23) is used to optimize available starting torque. Stop frequency (F25) is the frequency at which the drive will disengage.
UCPTTorqLimit	F40 and F41 E16 and E17	Sets the limits for driving and braking torque. Default settings are 999 (inactive). The range is 20 to 150% and can be changed in 1 percent increments. Braking torque can also be set to 0% to prevent over-voltage during deceleration errors (OU2). Used to set up external control of VSD functions F40 and F41. External control is implemented by setting one of the function codes, E01 to E09, to 14. These function codes correspond to digital input terminals X1 to X9. Please refer to pages 5-18 to 5-21 in the *AF-300 P11 Instruction Manual* for details.

Some network variables don't have VSD function codes associated with them, for example **`nciDrvSpeedScale`**.

Output Variables

Output variables provide operational data about the VSD and the motor it is driving. Table 2 lists the output variables, corresponding function codes, and descriptions.

The function codes for the output variables are type M (monitoring) codes. All the output variables associated with type M function codes rely on the **`nciMinTmOut`** and **`nciSndHrtBt`** configuration variables to keep output data current.

Table 2 Output variables

Variable	Function code	Index number	Description
nvoAlarm (1 byte unknown)	M16	30	Shows the code number of the current alarm. Please refer to the alarm code table on page 12-5 in the *AF-300 P11 Instruction Manual* for explanation of code numbers.
nvoAlarmCurrent (SNVT_amp)	M37	51	Shows the current output in amps of the VSD at the time of the alarm.
nvoAlarmFreqCmd (SNVT_freq_hz)	M31	45	Shows the frequency command setting (function code F01) at the time of the alarm.
nvoAlarmFreqOut (SNVT_freq_hz)	M35	49	Shows the output frequency in hertz of the VSD at the time of the alarm.
nvoAlarmLog (3 byte unknown)	M17 M18 M19	31 32 33	Contains a record of the code numbers of the last three alarms. Please refer to the alarm code table page 12-5 in the *AF-300 P11 Instruction Manual* for explanation of code numbers.
nvoAlarmOpCmd (4 byte unknown)	M39	53	Shows the direction of rotation (FWD or REV) of the VSD at the time of the alarm and whether the associated digital input (X1 to X5) was on or off.
nvoAlarmOpTime (SNVT_elapsed_tm)	M42	56	Shows the time in hours that the VSD was operating before the alarm was triggered. The range is 0 to 65535 hours and changes in one hour increments.

Table 2 Output variables (Continued)

Variable	Function code	Index number	Description
nvoAlarmPower (SNVT_power_kilo)	M36	50	Shows the VSD power in kilowatts at the time of the alarm.
nvoAlarmTorque (SNVT_lev_percent)	M33	47	Shows the actual torque at the time of the alarm as a percent.
nvoAlarmVolt (SNVT_volt)	M38	52	Shows the voltage at the time of the alarm.
nvoDrvCurrent (SNVT_amp)	M11	25	Shows the operating current in amperes of the VSD. The range is from 0 to 3276.6 amps.
nvoDrvPower (SNVT_power_kilo)	M10	24	Shows the VSD operating power in kilowatts. The range is from 0 to 6553.4 kW.
nvoDrvSpeed (SNVT_lev_percent)	M09	23	Shows the operating speed of the VSD as a percent of motor nameplate rpm.
nvoDrvVolt (SNVT_volt)	M12	26	Shows the operating voltage of the VSD. The range is 0 to 700 volts.
nvoInAlarm (SNVT_switch)			Indicates whether the VSD is running by showing an *on* status or in an alarm state showing an *off* status.
nvoOutputFreq (SNVT_freq_hz)	M09	23	Shows the operating frequency in hertz of the VSD.
nvoReadParamVal (SNVT_count)			Used with input from **`nviReadParamNum`** to display data from a VSD function code.
nvoStatus (SNVT_obj_status)			Shows the status of any object.

Table 2 Output variables (Continued)

Variable	Function code	Index number	Description
nvoTorque (SNVT_lev_percent)	M07	21	Shows the operating torque of the VSD as a percent.
nvoY1status (SNVT_switch)	M15	29	Shows whether the output terminals are set to on or off. Please refer to pages 5-22 to 5-24 in the *AF-300 P11 Instruction Manual* for details on terminal settings.
nvoY2status (SNVT_switch)	M15	29	
nvoY3status (SNVT_switch)	M15	29	
nvoY4status (SNVT_switch)	M15	29	
nvoX1status (SNVT_switch)	M13	27	Shows whether the input terminals are set to on or off. Please refer to pages 5-18 to 5-21 in the *AF-300 P11 Instruction Manual* for details on terminal settings.
nvoX2status (SNVT_switch)	M13	27	
nvoX3status (SNVT_switch)	M13	27	
nvoX4status (SNVT_switch)	M13	27	
nvoX5status (SNVT_switch)	M13	27	

Input Variables

Input variables are used to define operating parameters and control mechanisms for the VSD. Table 3 lists the input variables and descriptions.

Table 3 Input variables

Variable	Description
nviAlarmReset (SNVT_switch)	Resets the alarm trip mechanism to be triggered by the next alarm event.
nviAOcmd (SNVT_lev_percent)	Sets the value of Universal Analog Output as percent.
nviDrvSpeedScale (SNVT_lev_percent)	Speed of the drive as a percentage of the **nviDrvSpeedSetpt** value. It uses **nciSpeedScale** as a default value at startup or if it is not updated in the time specified in the **nciRcvHrtBt** variable. Negative values indicate a motor turning in reverse. The valid range is -163.840% to 163.830% and can be changed in 0.005% increments.
nviDrvSpeedSetpt (SNVT_switch)	Provides start/stop control and the setpoint for drive speed. It is also used as a reference when setting the **nviDrvSpeedScale** variable.
nviReadParamNum (SNVT_count)	Specifies the parameter number and data of a VSD function code for the **nvoReadParamVal** variable to display in Node Viewer.
nviRequest (SNVT_obj_request)	Provides the mechanism to request a mode for a particular object.
nviWriteParamNum (SNVT_count)	Specifies the index number of a VSD function code that does not have a network variable associated with it. Used with **nviWriteParamVal** for each function code you want to program.
nviWriteParamVal (SNVT_count)	Specifies the value to write to the index number specified in **nviWriteParamNum**. Used with **nviWriteParamNum** for each function code you want to program.

Table 3 Input variables (Continued)

Variable	Description
nviX1cmd (SNVT_switch) nviX2cmd (SNVT_count) nviX3cmd (SNVT_count) nviX4cmd (SNVT_count) nviX5cmd (SNVT_count)	Controls the on and off state of the X1 to X5 digital input terminals (function codes E01 to E05).

You can use the special purpose variables to configure digital input terminals X6 to X9 (VSD function codes E06 to E09).

Special Purpose Variables

Table 5 contains VSD function codes that don't have their own corresponding network variables. These codes complement the function codes associated with the configuration variables in Table 1. For example, the auto-start frequency fall rate (H14 in Table 5) uses the value in the **nciRampDownTm** variable (F08 in Table 1) as a reference.

The Interface Card gives lets you program these function codes with a PC instead of the VSD keypad by using the following special purpose variables:

- nviWriteParamVal
- nviWriteParamNum
- nviReadParamNum
- nvoReadParamVal

Use the index numbers in Table 5 to represent the VSD function codes.

To read from Special Purpose Variables:

- Set **nviReadParamNum** with the ID number corresponding to the function code.

  NvoReadParamVal will display the current setting for that function code and the value in **nviReadParamNum** is reset at zero. It will display in the data format specified in Table 4.

  The output data is static and will not be updated automatically, so when the value of the function code changes, it will not be displayed by **nvoReadParamVal** until you enter the index number into **nviReadParamNum** again.

To write to Special Purpose Variables:

1. Set the value in **nviWriteParamVal** variable corresponding to the function code using the data format indicated.
2. To write the value entered above to the drive, enter the ID number corresponding tothe function code in **nviwriteParamNum**.

Repeat steps 1 & 2 with the **nviWriteParamNum** variable. When you press Enter for this variable, the value is written to the VSD and the value of **nviWriteParamNum** is automatically reset to zero.

Table 4 Data format number descriptions

Data Format	Description
1	Unsigned integer data (Positive): Min. unit 1
3	Unsigned Decimal data (Positive): Min. unit 0.1
5	Unsigned integer data (Positive): Min. unit 1
12	Index data (ACC/DEC time, display coefficient) 0: Positive (+),0: 0.01X001-999(0.00-9.99) 1: Negative (-)1: 0.1X00-999(10.0-99.9) 2: 1X100-999(100-999) 3: 10X100-999(1000-9990)
19	Amperage value Decimal data (positive): Min. unit 0.01 inverter capacity is not more than 30HP Min. unit 0.01 for not less than 40HP

Table 5 Additional VSD function code

Function code	Index number	Data Format	Change While Drive	Description
F02 Operation method	72	1	N	Setting this function code to 1 enables the STOP key on the VSD to act as an emergency stop button.
F09 Torque boost	79	12	Y	Setting this function code between 0.5 and 0.8 is adequate for loads associated with fan and pump applications.
F10 F11 F12 Motor overheating protection	80 81 82	3 1 19	Y Y Y	Setting F10 to 1 activates overheating protection of the motor. The F11 setting indicates the percentage of rated motor current (recommend 100%) allocated to the protective relay. The value in F12 (5 minutes for 30 hp VSD, 10 minutes for 40 hp VSD) indicates the time that the motor is allowed to operate at 150 % of the current set in F11.
F14 Restart after power failure	84	1	N	Setting this function code to 3 automatically restarts the motor at the frequency it was at before the power failure.
E06 E07 E08 E09	111 112 113 114	1 1 1 1	N N N N	This setting enables you to control the on/off function and view the operating status of terminals X6 to X9.

Function code	Index number	Data Format	Change While Drive	Description
E20	123	1	N	This setting enables you to to assign a function to each Y output. (See the list of 33 functions in the AF-300 P11 Instruction Manual, page 5-22.)
E21	124	1	N	
E22	125	1	N	
E23	126	1	N	
E24	127	1	N	
P01 Number of motor poles	157	1	N	The correct number of poles in the motor (based on motor specifications) must be specified to have the correct motor frequency displayed on the drive LED.
P03 Motor rated current	159	19	N	Set this value to the current rating on the motor nameplate.
H03 Function value reset	166	1	N	Setting this function code to 1 enables you to reset all the function values that you have changed, back to the default factory settings.
H04	167	1	Y	The H04 function set to 1 indicates the VSD will reset only once after a problem occurs such as overvoltage or overheating. The H05 function set to 20 seconds indicates the VSD will wait this amount of time until a run command starts it up again.
H05 Auto-reset controls	168	1	Y	
H06 Cooling fan operation	169	1	Y	Setting this to 1 regulates the operation of the cooling fan in the VSD by turning it on or off automatically to maintain a safe operating temperature.

Function code	Index number	Data Format	Change While Drive	Description
H07 Acceleration and deceleration pattern	170	1	N	Setting this to 1 (mild) reduces wear on the motor by smoothing the output frequency changes during acceleration and deceleration.
H08 Reverse lock out	171	1	N	Setting this to 1 prevents a reverse command from being entered into the VSD by accident.
H09 Start mode	172	1	N	Setting this function to 2 enables it to work with the F14 restart function to smoothly restart the motor at the frequency it is coasting at.
H10 Energy saving mode	173	1	Y	Set to 1, this function monitors the voltage used in fan and pump applications where the torque load varies, and adjusts the output voltage to optimize energy consumption.
H11 Deceleration mode	174	1	Y	Setting this function to 1 will enable the motor to coast to a stop when the STOP command is entered.
H13 Auto-restart time	176	3	N	This function set to 5 seconds indicates the amount of time that the VSD rests after a brief power failure.

Function code	Index number	Data Format	Change While Drive	Description
H14 Auto-restart frequency fall rate	177	5	Y	Set to 0.00, this function enables the VSD frequency to be reduced according to the deceleration time set in F08.
H19 Active drive acceleration	181	1	Y	Set to 1, this function will automatically increase the acceleration time by three times the value of F07 if the VSD temperature is getting too high.

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